www.oeko.de

Crediting the displacement of non-renewable biomass under the CDM

Submission by Öko-Institut to the public call by the Executive Board of the Clean Development Mechanism

Berlin, April 2007

Lambert Schneider – l.schneider@oeko.de

Öko-Institut e.V.

Büro Berlin
Novalisstraße 10
D-10115 Berlin
Tel.: +49-(0)30-280 486-80
Fax: +49-(0)30-280 486-88

Geschäftsstelle Freiburg
Merzhauser Straße 173
D-79100 Freiburg i.Br.
Tel.: +49-(0)761-45295-0
Fax: +49-(0)761-475437

Büro Darmstadt
Rheinstraße 95
D-64295 Darmstadt
Tel.: +49-(0)6151-8191-0
Fax: +49-(0)6151-8191-33
http://www.oeko.de

1 Introduction

The displacement of non-renewable biomass under the Clean Development Mechanism (CDM) has been discussed controversially since 2005 when the CDM Executive Board had withdrawn a small-scale methodology for the displacement of non-renewable biomass. Most Parties have acknowledged the considerable benefits for sustainable development of these project types, in particular regarding poverty alleviation and reducing health risks. Furthermore, enabling such projects under the CDM may contribute to changing the geographical distribution of CDM projects since these project types are particularly interesting for countries that heavily rely on biomass as a fuel, as it is the case in many Least Developed Countries (LDCs).

The main controversy in the past 18 months has been around the methodological challenges, the consistency with the paragraph 7 (a) of decision 17/CP.7 – which limits LULUCF projects to afforestation and reforestation during the first crediting period – and the potential implications for and relationship to the ongoing SBSTA discussions on reducing emissions from deforestation.

This paper first discusses the methodological and legal challenges of crediting such projects and then provides an indicative proposal for two small-scale methodologies. Note that this paper only expresses the view of Öko-Institut and not that of the German government, the European Union or any other organization.

2 Methodological challenges

2.1 Project types under discussion

In the debate about the displacement of non-renewable biomass under the CDM reference has been made to a number of different types of project activities. In considering the methodological challenges, it appears helpful to differentiate between these different types of project activities according to the following categories:

A. **Renewable energy technology projects** that introduce a new renewable energy technology that replaces the existing non-renewable biomass technology but that does either not use biomass at all or only uses biomass residues. This includes, for example, project activities displacing existing fuel wood cooking stoves with solar cookers or biogas cookers.

B. **Energy efficiency improvement projects** that increase the efficiency of using non-renewable biomass, thereby resulting in a reduction of the use of non-renewable biomass. This includes, for example, project activities that increase the efficiency of fuel wood cooking stoves that are fired with non-renewable biomass.

C. **Biomass production projects** that increase the availability of renewable biomass by establishing new biomass plantations and thereby displace the current use of non-renewable biomass. This includes, for example, project activities that establish new biomass plantations around villages for the purpose of providing fuel wood, or project activities which start utilizing biomass residues that were previously left to decay or burned on fields.

D. **Biomass protection or management projects** that better protect or manage land areas and thereby increase in the longer term the availability of renewable biomass. This includes, for example, project activities that better manage the land area around villages in order to increase the availability of fuel wood. Another example would be a paper plant that has previously deforested a certain land area and that starts under the CDM managing that land area in a sustainable manner, thereby switching from the use of non-renewable biomass to the use of renewable biomass.

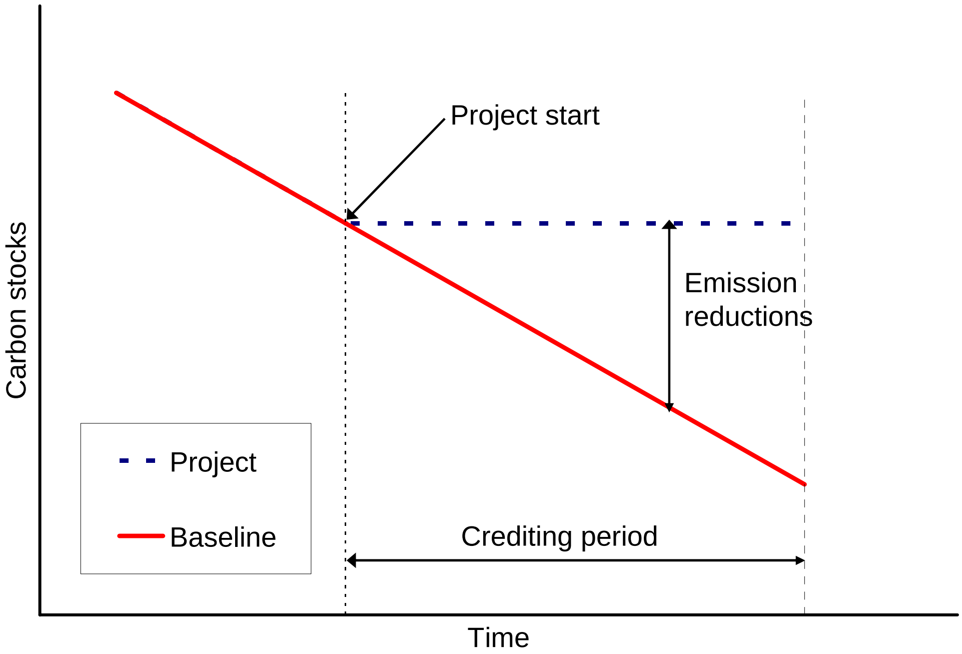
The first two categories (A and B) decrease the use of non-renewable biomass and thus reduce the **demand** for the non-renewable biomass, similar to CDM project activities that reduce the demand for fossil fuels by introducing a renewable energy technology or improving energy efficiency. The latter two categories (C and D) increase the **supply** of renewable biomass, by either establishing new plantations or by managing or protecting biomass resources. Category C is related to category A, as the establishment of a new plantation is similar to using a new renewable energy technology.

In the following, we illustrate the general methodological challenges associated with such project types, taking into account the differences regarding these four project categories.

2.2 Definition of renewable biomass

"*Renewable biomass*" has been defined by EB23 (Annex 18 to EB23 report). Basically, renewable biomass means biomass that is grown in a "sustainable" manner not involving long-term losses of carbon stocks. In contrast, *non-renewable biomass* means that the extraction of biomass from a land area is not sustainable and that carbon stocks on the land area decrease over time.

The key distinction between non-renewable and renewable is whether carbon stocks are affected by using the biomass. Emission reductions from switching from non-renewable to renewable biomass result from the fact that levels of carbon stocks are maintained in the project (use of renewable biomass) whereas they would decrease in the baseline (use of non-renewable biomass). This is illustrated in the Figure below.



The distinction between renewable and non-renewable biomass is challenging, as the definition provided by the Executive Board focuses on the long-term effects on carbon stocks. However, these are difficult to evaluate at the start of the project activity. Additional guidance on the differentiation between renewable and non-renewable biomass is therefore required, either in specific methodologies for the displacement of non-renewable biomass or as a general guidance by the EB.

2.3 Consistency with paragraph 7(a) of decision 17/CP.7

Paragraph 7(a) of 17/CP.7 limits crediting of LULUCF activities to afforestation and reforestation – and, hence, excludes crediting the avoidance of losses of carbon stocks. Based on this decision in Marrakech, EB20 clarified that non-AR project activities should consider

- any **decrease** of carbon stocks as a result of the project activity as emissions, and
- not get credits from any **increase** of carbon stocks as a result of the project activity.

As illustrated in the figure above, in case of the replacement of non-renewable biomass with renewable biomass the emission reductions result from the fact that carbon stocks of biomass resources are higher in the project case than in the baseline situation. However, directly crediting such increases of carbon stocks as a result of the project activity does not seem consistent with the EB20 guidance and spirit of paragraph 7 (a) of decision 17/CP.7.

Therefore, as a first conclusion, it seems not consistent with the Marrakech Accords to credit the carbon stock or LULUCF changes associated with such projects. This would be the case if the carbon content of the displaced non-renewable biomass would be the basis for determining emission reductions.

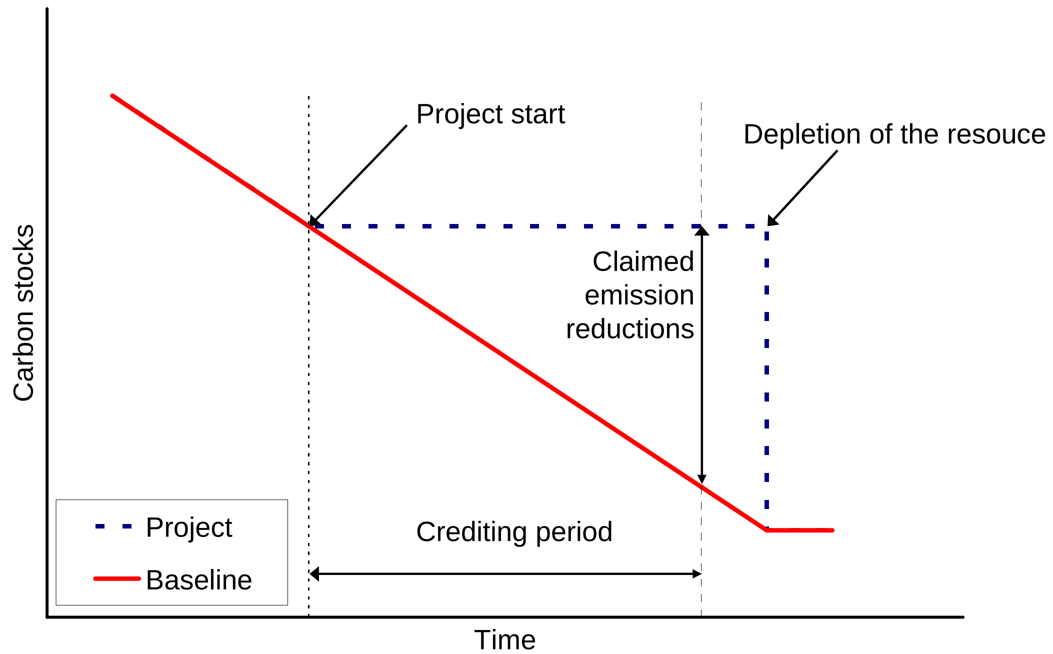
2.4 Non-permanence

A general difference to energy projects is the potential *non-permanence* of emission reductions. If the loss of carbon stocks on a land area is avoided through a project, there is the risk that the prevented losses of carbon stocks may occur at a later stage due to unforeseen circumstances. In this case, previously achieved emission reductions would be offset and the project would not have resulted in any real net emission reductions but only in a *temporary* delay of the losses of carbon stocks.

The sources of non-permanence may be different. For example:

- Third parties (e.g., other villages, paper plants) may get access to the land area and extract biomass in a non-sustainable manner.
- Forest fires, droughts or other natural events may result in the loss of the carbon stocks.
- The project may simply fail at a certain point in time and the biomass resources may be depleted at a later stage.

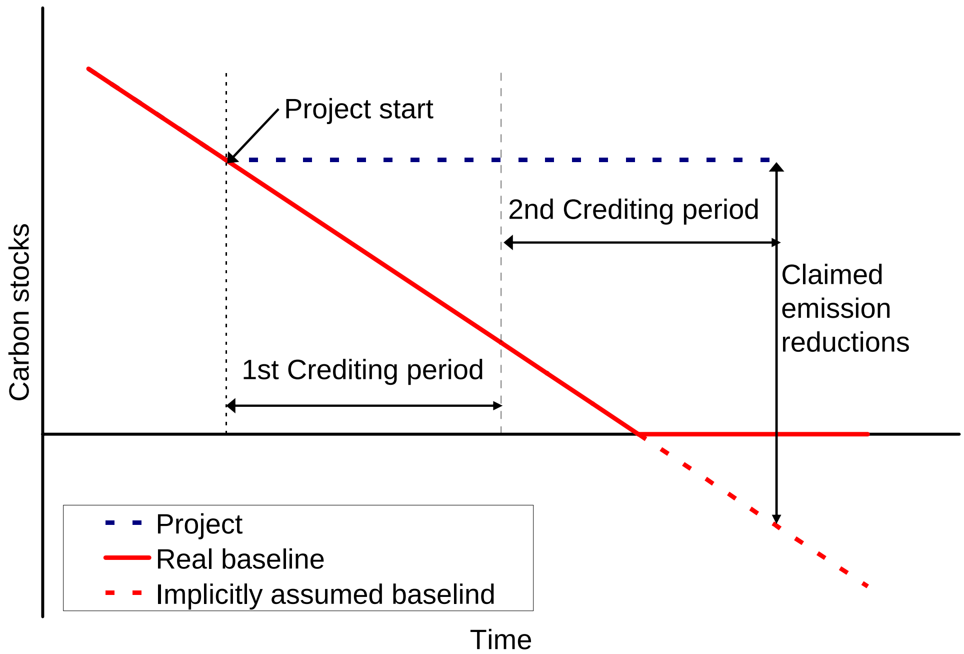
This is schematically indicated in the figure below. Here it is assumed that one year after the crediting period, the sustainably managed biomass resources are depleted, e.g. due to extraction of biomass by another user or natural event such as a forest fire.



The potential non-permanence seems difficult to handle without the introduction of temporary units or liability provisions in the Kyoto accounting scheme. Temporary units were introduced for both AR project activities under the CDM (lCERs and tCERs) and changes in carbon stocks under Article 3.3 and 3.4 of the Kyoto Protocol (RMUs which need to be cancelled if a removal turns to become a source). Thus, so far changes of carbon stocks are accounted through temporary units under the Kyoto Protocol. Issuing permanent CERs for potentially temporary emission reductions based on the carbon content of the biomass would change this accounting principle – without dealing with non-permanence by other means.

2.5 Existing carbon stocks are not endless

Another methodological problem is the fact that the existing carbon stocks are not endless and that consequently also the use of "*non-renewable biomass*" can only continue for a certain time – until the carbon stocks are depleted. A methodology that calculates emission reductions based on the carbon content of the "*non-renewable biomass*" implicitly assumes that the biomass resources could continue to be depleted in the same manner throughout all crediting periods. This may not necessarily be the case, as shown in the figure below. At a certain point (in the figure during the 2nd crediting period) there would not be any biomass left that could be used. Continuing the crediting based on the amount of non-renewable biomass not used as a result of the project would ignore that one can not decrease carbon stocks below zero. Thus, in order to avoid that CERs are issued for a situation that could never happen, a methodology would need to consider the quantity of carbon stocks in the relevant land area at the start of the project activity and cap any future emission reductions by the amount of carbon stocks that can *physically* and be depleted under realistic assumptions. This may require establishing a baseline scenario for the fate of land which is methodologically challenging and associated with uncertainties.



3 General approach towards crediting

The methodological challenges outlined above apply if the carbon content of the biomass is taken as the basis for crediting emission reductions. In this case, it is implicitly assumed that the use of non-renewable biomass results in a similar loss of carbon stocks on the respective land areas. Addressing directly these methodological challenges seems difficult, as broader questions, such as general accounting issues, would need to be considered. However, some of these methodological challenges can be solved if the impact of such project activities is analyzed from an energy supply and demand perspective.

3.1 Renewable energy technology and energy efficiency projects

The project categories A (Renewable energy technologies) and B (energy efficiency projects) reduce the demand for non-renewable biomass. This may have two different impacts:

(a) The non-renewable biomass resources may not be depleted anymore, resulting in higher carbon stocks than in the absence of the project activity.

(b) The non-renewable biomass may be used, immediately or at a future point in time, by third parties or the project participants themselves.

Case (a) has been analyzed and discussed above. Higher carbon stocks result in a removal of CO_2 from the atmosphere and thus emission reductions, however, issues such as permanence would need to be addressed, and legal questions around the consistency with paragraph 7 (a) of decision 17/CP.7 arise.

Case (b) may occur, for example, if the inhabitants of a village can decrease the distance where they gather fuel wood from as a result of project activity. This may enable other users (e.g. other villages) to get better access to biomass and to make use of it. It may also enable the villages in the project area to use the biomass for other purposes (e.g. for electricity generation). In the end, the availability of biomass is increased, which can result in an increased use of biomass as a resource (for new purposes or by third parties).

Similarly, after recovery/regeneration of the land area, people may start to extract biomass from that land area in a sustainable manner. In this case, the project would first result in an increase in carbon stocks (case a) but in a longer term perspective, once the carbon stocks have increased, it would become possible to use the land area in a more sustainable manner with more biomass being available. As above, additional biomass resources would become available.

The increased availability and use of biomass will in a longer term perspective very likely avoid the use of fossil fuels. For example, biomass may become available for purposes where currently fossil fuels have been used or would be used in the future, such as, for example, off-grid electricity generation or transportation (biofuels). Furthermore, it can be argued that, in a longer term perspective, the users of the non-renewable biomass would have to switch to fossil fuels (e.g. kerosene for stoves), as an implicit assumption of the projects is that the pressure on the biomass and the loss of carbon stocks would continue in the absence of the project (see figure above).

Also from a broader economic and energy supply perspective, decreasing the energy demand by improving energy efficiency or introducing new renewable energy technologies will in most economies in the long-term avoid or reduce the use of fossil fuels. In a country where both biomass and fossil fuels are used, a decrease in the energy demand or the energy generation with new renewable energy technologies will in a long-term perspective more likely result in a reduction of the use of fossil fuels rather than in a permanent reduction of the biomass use.

Such a perspective on these project types allows solving immediately some of the methodological challenges raised above:

- The consistency with paragraph 7 (a) of decision 17/CP.7 is of much lesser concern, as only the long-term effect of decreasing the use of fossil fuels is credited rather than crediting higher carbon stocks in the project than in the baseline.
- The issue of non-permanence is circumvented, since crediting focuses on the long-term impacts from on energy supply and energy demand and not on the land areas.
- No precedent is created for the discussion on reducing emission from deforestation, as this approach is only applicable to project activities that reduce the consumption of biomass but not to the protection or management of land areas.

3.2 Biomass production projects

The project category C (biomass production projects) is similar to category A (renewable energy technology projects). This project type increases the supply of renewable biomass, which may as well, in a longer term perspective and from a broader energy supply and demand perspective, avoid or displace the use of fossil fuels.

However, this category involves some additional challenges:

- **Distinction between land management and protection and new plantations.** As outlined below, we believe that land management and projection projects are not consistent with paragraph 7 (a) of decision 17/CP.7 and raise a number of methodological concerns that can not be addressed within the existing modalities and procedures for the CDM. Therefore, it would need to be ensured that new biomass plantations are established as a result of the project activity and that not existing biomass sources are only managed in a different manner. Furthermore, it would need to be ensured that a new plantation is established, as otherwise biomass may only be diverted from previous uses to the project activity rather than increasing the availability of biomass. A methodology would need to include respective applicability conditions.
- **Emissions from the cultivation of the biomass.** EB25 clarified that in general all project activities using biomass for energy should account for emissions associated with production of biomass, except in case where the biomass originates from AR project activities. In this regard, simplified methodological approach to account for the emissions associated with the production of the biomass would need to be included in a methodology.
- **Shifts of pre-project activities**. In many cases, the land areas where the biomass plantation is established have already provided goods or services. With the implementation of the project activity, these activities may be shifted. Emissions from shift of pre-project activities may in some cases need to be taken into account (see guidance by EB29).

- **Double counting**. It would need to be ensured that CERs are only accounted once and not for the consumer and the producer. This is probably easy to fix for most small-scale projects.

3.3 Biomass protection or management projects

In case of projects that increase the biomass supply by protecting or managing land areas in a different manner (category D), the project activity is a change in the management of land areas. This is not consistent with paragraph 7 (a) of decision 17/CP.7. Moreover, most of the methodological challenges discussed above, such as non-permanence, can not be addressed within the existing modalities and procedures for such project activities. We therefore believe that this project category should not be eligible under the CDM.

4 Indicative proposal for small-scale methodologies

In the following, an indicative proposal for small-scale methodologies for the first two project categories (A and B) is provided. For category C, no proposal is provided, as the methodological challenges appear to be difficult to address.

The proposals are only an indicative methodology where additional guidance may need to be added. The proposal is based on a draft methodology prepared by the small-scale working group (SSCWG) under the CDM Executive Board and has been further modified.

The methodology proposed by the SSCWG has been criticized by different stakeholders for different reasons, including that the methodology does not provide sufficient CERs to such projects types to make them attractive for the CDM. We believe that the calculation of emission reductions should not be based on the rationale to make project types attractive for the CDM but rather, as required by the modalities and procedures for the CDM, based on the real emission reductions that the projects achieves. However, we note that the approach proposed below calculates emission reductions based on the energy content of the non-renewable biomass savings and results in more CERs than the original proposal by the SSCWG.

Several Parties have also expressed concerns to allow such projects for large-scale methodologies or for commercial or industrial small-scale applications (e.g. paper plants, etc). We therefore suggest limiting the applicability to household consumers and to small-scale project activities.

In the following, two indicative methodologies are suggested.

4.1 Indicative methodology for renewable energy technologies

Title

Switch from non-renewable biomass to renewable energy technologies by household consumers

Technology/measure

This measure is the replacement of existing thermal energy generation appliances that are managed by household consumers and that are fired with non-renewable biomass (such as fuel wood cooking stoves) with new renewable thermal energy technologies that either do not use biomass or only use biomass residues (such as solar cookers or biogas cookers or cooking stoves using biomass residues).[1]

Boundary

The project boundary includes all sites where the new renewable energy technologies are installed as well as the geographical area where the non-renewable biomass is sourced from. The project boundary should be clearly delineated in the CDM-PDD using maps and GPS data.

Baseline

It is assumed that in the absence of the project activity, the baseline scenario would be the continued use of non-renewable biomass using the same technology and/or the use of fossil fuels as a replacement for the non-renewable biomass (e.g. at a future point in time when the biomass source would be depleted). It is further assumed that the project activity, by reducing the demand for non-renewable biomass, results, in a longer term perspective, in an increased availability of biomass that allows avoiding or reducing the use of fossil fuels. Therefore, the indirect effect of this project type of displacing fossil fuels is considered for the purpose of calculating emission reductions.

Emission reductions

Emission reductions are based on the energy content of the non-renewable biomass that is saved as a result of the project activity and the CO_2 emission factor of the fossil fuel type that would most likely be used in place of the non-renewable biomass, as follows:

$$ER_y = f_{NRB,y} \times B_y \times EF_{CO2,FF}$$

where:

ER_y	=	Emission reductions in year *y* (tCO_2)
$f_{NRB,y}$	=	Fraction of biomass used in the absence of the project activity in year *y* that is non-renewable
B_y	=	Quantity of biomass use saved as a result of the project activity in year *y* (GJ)
$EF_{CO2,FF}$	=	CO_2 emission factor of the fossil fuel type that would most likely be used instead of biomass in the region (assume natural gas liquids with an emission factor of 0.064 t CO_2/GJ as a default in the absence of better information) (t CO_2/GJ)

[1] Methodologies that use renewable biomass as new energy generation technologies would need to include approaches (a) to verify that the project is the establishment of new plantation on land which did not provide biomass prior to the implementation of the project activity, (b) to estimate emissions associated with the cultivation of biomass, (c) to address shifts of pre-project activities, and (d) to avoid double counting of CERs.

The quantity of biomass that is saved as a result of the project activity is calculated based on the monitored heat generation by the new technology and the efficiency of the non-renewable biomass technology in the baseline, as follows:

$$B_y = \frac{HG_{PJ,y}}{\eta_{BL,NRB}}$$

where:

B_y = Quantity of biomass use saved as a result of the project activity in year *y* (tons of dry matter)

$HG_{PJ,y}$ = Quantity of heat generated by the new renewable energy technology used in the project in year *y* (GJ)

$\eta_{BL,NRB}$ = Efficiency of the non-renewable energy technology that would be used in the absence of the project activity

The heat generation in the project case should be

(a) monitored directly or,

(b) where applicable, be calculated based on the quantity of fuel used and the efficiency of the technology used in the project case, as follows:

$$HG_{PJ,y} = FC_{PJ,y} \times NCV_{PJ} \times \eta_{PJ}$$

where:

$HG_{PJ,y}$ = Quantity of heat generated by the new renewable energy technology used in the project in year *y* (GJ)

FC_y = Quantity of fuel consumed in the project technology in year *y* (volume or mass unit, on a dry basis)

NCV_{PJ} = Net calorific value of the fuel type used in the project technology (GJ/mass or volume unit)

η_{PJ} = Efficiency of the project technology

(c) where applicable, be calculated based on a defined quantity of service provided (e.g. meals cooked). *Note: this may need some further elaboration.*

The fraction of biomass that is non-renewable (f_{NRB}) should be determined based on an analysis of the biomass sources and the demand for biomass within the project boundary, taking into account historic trends. A reasonable scenario for the fraction of renewable and non-renewable biomass use during the crediting period in the absence of the project activity should be established. In doing so, the size of the existing above-ground biomass stock within the project boundary should be estimated, using simplified approaches based on the 2006 IPCC Guidelines. Emission reductions can only be claimed as long as the accumulated amount of non-renewable biomass that is displaced from the start of the project activity until the year *y* is smaller than the existing above-ground biomass stock at the start of the project activity. *Note: More elaborated methods may be provided.*

All parameters should be chosen in a conservative manner and the choice should be justified.

If the renewable energy technology used in the project is already used by some households within the project boundary, project participants should whether and to which extent the households participating in the project would also switch to that technology in the absence of the project activity (free-riders). If relevant, the emission reductions should be adjusted accordingly.

Project participants should determine the average lifetime of the existing biomass technologies. The average remaining technical lifetime should be larger or the same as the crediting period.

Leakage

No leakage calculation is required.

Note for explanation: The issue that third parties may use the non-renewable biomass instead of the project participants appears less relevant for the proposed approach, as this may as well result in the avoidance or reduction of the use of fossil fuels. By defining the project boundary appropriately it would also be ensured that those third parties can not claim CERs for using the biomass from the area within the project boundary.

Monitoring

Monitoring shall consist of an annual check of all appliances or a representative sample thereof to ensure that they are still operating or replaced by a new appliance equivalent in service.

Furthermore monitoring consists of a sampling of the quantity of heat generated per appliance.

Representative sampling at randomly chosen households may be used to calculate emission reductions. The parameters that are sampled should be adjusted for their sampling uncertainty at a 95% confidence level.

4.2 Indicative methodology for energy efficiency improvement projects

Title

Energy efficiency improvements of thermal household appliances that use non-renewable biomass

Technology/measure

This measure is the improvement of the energy efficiency of existing thermal energy generation appliances that are managed by household consumers and that are fired with non-renewable biomass (such as fuel wood cooking stoves) by retrofit or replacement.

Boundary

The project boundary includes all sites where the energy efficiency of appliances is improved as well as the geographical area where the non-renewable biomass is sourced from. The project boundary should be clearly delineated in the CDM-PDD using maps and GPS data.

Baseline

It is assumed that in the absence of the project activity, the baseline scenario would be the continued use of the existing thermal appliances and/or the use of fossil fuels as a replacement for the non-renewable biomass (e.g. at a future point in time when the biomass source would be depleted). It is further assumed that the project activity, by reducing the demand for non-renewable biomass, results, in a longer term perspective, in an increased availability of biomass that allows avoiding or reducing the use of fossil fuels. Therefore, the indirect effect of this project type of displacing fossil fuels is considered for the purpose of calculating emission reductions.

Emission reductions

Emission reductions are based on the energy content of the non-renewable biomass that is saved as a result of the project activity and the CO_2 emission factor of the fossil fuel type that would most likely be used in place of the non-renewable biomass, as follows:

$$ER_y = f_{NRB,y} \times B_y \times EF_{CO2,FF}$$

where:

ER_y	=	Emission reductions in year *y* (tCO_2)
$f_{NRB,y}$	=	Fraction of biomass used in the absence of the project activity in year *y* that is non-renewable
B_y	=	Quantity of biomass use saved as a result of the project activity in year *y* (GJ)
$EF_{CO2,FF}$	=	CO_2 emission factor of the fossil fuel type that would most likely be used instead of biomass in the region (assume natural gas liquids with an emission factor of 0.064 t CO_2/GJ as a default in the absence of better information) (t CO_2/GJ)

The quantity of biomass that is saved as a result of the project activity is calculated based on the monitored quantity of biomass used in the project activity and the efficiencies of the thermal application in the project activity and in the baseline, as follows:

$$B_y = B_{PJ,y} \times \left[\frac{\eta_{PJ}}{\eta_{BL}} - 1 \right]$$

where:

B_y	=	Quantity of biomass use saved as a result of the project activity in year *y* (tons of dry matter)
$B_{PJ,y}$	=	Monitored quantity of biomass used in the thermal energy generation appliance in the project in year *y* (tons of dry matter)
η_{PJ}	=	Energy efficiency of the thermal energy generation appliance in the project
η_{BL}	=	Energy efficiency of the thermal energy generation appliance in the baseline

The fraction of biomass that is non-renewable (f_{NRB}) should be determined based on an analysis of the biomass sources and the demand for biomass within the project boundary, taking into account historic trends. A reasonable scenario for the fraction of renewable and non-renewable biomass use during the crediting period in the absence of the project activity should be established. In doing so, the size of the existing above-ground biomass stock within the project boundary should be estimated, using simplified approaches based on the 2006 IPCC Guidelines. Emission reductions can only be claimed as long as the accumulated amount of non-renewable biomass that is displaced from the start of the project activity until the year *y* is smaller than the existing above-ground biomass stock at the start of the project activity. *Note: More elaborated methods may be provided.*

All parameters should be chosen in a conservative manner and the choice should be justified.

If the project technology is already used by some households within the project boundary, project participants should whether and to which extent the households participating in the project would also switch to that technology in the absence of the project activity (free-riders). If relevant, the emission reductions should be adjusted accordingly.

Project participants should determine the average lifetime of the existing thermal energy generation appliances. The average remaining technical lifetime of the existing appliances should be larger or the same as the crediting period.

Leakage

No leakage calculation is required.

Note for explanation: The issue that third parties may use the non-renewable biomass instead of the project participants appears less relevant for the proposed approach, as this may as well result in the avoidance or reduction of the use of fossil fuels. By defining the project boundary appropriately it would also be ensured that those third parties can not claim CERs for using the biomass from the area within the project boundary.

Monitoring

Monitoring shall consist of an annual check of all appliances or a representative sample thereof to ensure that they are still operating or replaced by a new appliance equivalent in service.

Furthermore monitoring consists of a sampling of the quantity of biomass that is fired in the project appliances.

Representative sampling at randomly chosen households may be used to calculate emission reductions. The parameters that are sampled should be adjusted for their sampling uncertainty at a 95% confidence level.